CT 00-020
PATENT

Clean Version of Claims

Please substitute the following claims, for the numerically corresponding, currently pending claims.

1. (Amended) A method of fabricating a low profile integrated module comprising the steps of:

providing a first sheet of material defining two adjacent integrated module first components, and forming a via extending through the first sheet between the two adjacent integrated module first components;

filling the via with a conductive metal;

providing a second sheet of material defining two adjacent integrated module second components;

providing a connection pad on a lower surface of the first sheet of material and contacting a lower surface of the portion of the via filled with conductive metal;

fixing the first and second sheets in overlying relationship with the two adjacent integrated module first components aligned with the two adjacent integrated module second components to form two adjacent integrated modules; and

cutting the first and second sheets, through the via to separate the first and second sheets into separate integrated modules, each module having a portion of the via filled with conductive metal in a periphery thereof and extending along a portion of the periphery.

2. A method of fabricating a low profile integrated module as claimed in claim 1 wherein the steps of providing the first sheet of material and providing the second sheet of material include providing sheets of printed circuit boards.

3. A method of fabricating a low profile integrated module as claimed in claim 2 wherein the step of filling the via with the conductive metal includes filling the via with a solder paste.

4. A method of fabricating a low profile integrated module as claimed in claim 1 wherein the steps of providing the first sheet of material and providing the second sheet of material include providing sheets of unfired ceramic material.

5. A method of fabricating a low profile integrated module as claimed in claim 4 wherein the steps of providing sheets of unfired ceramic material include providing sheets of Al_2O_3, glass particles and a binder.

6. A method of fabricating a low profile integrated module as claimed in claim 5 further including a step of firing the unfired ceramic material subsequent to the cutting step at a firing temperature high enough to form ceramic modules.

7. A method of fabricating a low profile integrated module as claimed in claim 6 wherein the step of filling the via with the conductive metal includes using a conductive metal with a melting temperature greater than the firing temperature.

8. A method of fabricating a low profile integrated module as claimed in claim 1 wherein the step of providing the first sheet of material further includes providing a plurality of first sheets of material each including a via extending therethrough.

9. A method of fabricating a low profile integrated module as claimed in claim 8 wherein the step of providing the second sheet of material further includes providing a plurality of second sheets of material.

10. A method of fabricating a low profile integrated module as claimed in claim 8 wherein the step of fixing the first and second sheets in overlying relationship aligns vias in the plurality of first sheets to produce a common via extending partially through the two adjacent integrated modules from a lower surface of a lower sheet to an upper surface of an intermediate sheet.

11. A method of fabricating a low profile integrated module as claimed in claim 10 where, in the steps of providing the plurality of first sheets and providing the plurality of second sheets, the pluralities provided result in the common via extending in a range from approximately 75 μm to approximately one half of a distance between a lower surface of a lower sheet and an upper surface of an upper sheet.

12. A method of fabricating a low profile integrated module as claimed in claim 1 wherein the step of forming the via includes forming a hole with a cross-sectional dimension in a range of approximately 125 μm to approximately 500 μm.

13. A method of fabricating a low profile integrated module as claimed in claim 12 wherein the step of forming the hole further includes forming a plurality of adjacent, partially overlapping, holes to define a single via with an elongated cross-section.

15. (Amended) A method of fabricating a low profile integrated module as claimed in claim 1 wherein the step of providing the connection pad includes providing a connection pad with a contact surface area substantially greater than a cross-sectional area of the portion of the via.

16. A method of fabricating a low profile integrated module as claimed in claim 1 wherein the step of forming the via includes forming a plurality of spaced apart vias and further including a step of providing a stress relief anchor pad spaced approximately an equal distance from each of the plurality of spaced apart vias.

17. (Amended) A method of fabricating a low profile integrated module comprising the steps of:

providing a plurality of first sheets of unfired ceramic material each defining two adjacent integrated module first components, and forming a plurality of vias extending through the plurality of first sheets between the two adjacent integrated module first components;

filling each of the plurality of vias with a conductive metal paste;

providing a plurality of second sheets of unfired ceramic material each defining two adjacent integrated module second components;

providing a connection pad on a lower surface of a lowermost sheet of the plurality of first sheets of unfired ceramic material and contacting the lower surface of the portion of the via filled with conductive metal;

fixing the plurality of first sheets and the plurality of second sheets in overlying relationship with the two adjacent integrated module first components aligned with the two adjacent integrated module second components to form two adjacent integrated modules;

cutting the fixed pluralities of first and second sheets, through the pluralities of vias to separate the fixed pluralities of first and second sheets into two separate integrated modules, each module having a portion of each of the plurality of vias in a periphery thereof and extending along a portion of the periphery; and

firing the two separate integrated modules at a firing temperature high enough to form ceramic modules, the conductive metal having a melting temperature greater than the firing temperature.

18. A method of fabricating a low profile integrated module as claimed in claim 17 wherein the step of providing the plurality of first sheets of unfired ceramic material further includes providing one of the plurality of first sheets of unfired ceramic material with an enlarged opening in communication with one of the plurality of vias.

19. (Amended) A method of fabricating a low profile integrated module as claimed in claim 17 wherein the step of providing one of the plurality of first sheets of unfired ceramic material with an enlarged opening includes a step of at least partially filling the enlarged opening with the conductive metal paste thereby forming the connection pad in contact with the lower surface of the portion of the via filled with conductive metal in the periphery.

20. A method of fabricating a low profile integrated module as claimed in claim 17 wherein the step of fixing the pluralities of first and second sheets of unfired ceramic material in overlying relationship aligns vias in the plurality of first sheets of unfired ceramic material to produce a common via extending partially through the two adjacent integrated modules from a lower surface of a lower sheet

of unfired ceramic material to an upper surface of an intermediate sheet of unfired ceramic material.

21. A method of fabricating a low profile integrated module as claimed in claim 20 where, in the steps of providing the plurality of first sheets of unfired ceramic material and providing the plurality of second sheets of unfired ceramic material, the pluralities provided result in the common via extending in a range from approximately 25 μm to approximately one half of a distance between a lower surface of a lower sheet of unfired ceramic material and an upper surface of an upper sheet of unfired ceramic material.

22. A method of fabricating a low profile integrated module as claimed in claim 17 wherein the step of forming the via includes forming a hole with a cross-sectional dimension in a range of approximately 125 μm to approximately 500 μm.

23. A method of fabricating a low profile integrated module as claimed in claim 22 wherein the step of forming the hole further includes forming a plurality of adjacent, partially overlapping holes to define a single via with an elongated cross-section.

24. A method of fabricating a low profile integrated module as claimed in claim 17 further including a step of providing a stress relief anchor pad on an exposed surface of one of the plurality of first sheets of unfired ceramic material, the stress relief anchor pad being spaced approximately an equal distance from each of the plurality of spaced apart vias.

25. A method of fabricating a low profile integrated module comprising the steps of:

providing a first sheet of material defining two adjacent integrated module first components, and forming a plurality of spaced apart vias extending through the first sheet between the two adjacent integrated module first components;

providing two stress relief anchor pads on a surface of the first sheet of material, one each of the two stress relief anchor pads being positioned within each of the two adjacent integrated module first components, and each of the two stress relief anchor pads being spaced approximately an equal distance from each of the plurality of vias;

filling the plurality of vias with a conductive metal;

providing a second sheet of material defining two adjacent integrated module second components;

fixing the first and second sheets in overlying relationship with the two adjacent integrated module first components aligned with the two adjacent integrated module second components to form two adjacent integrated modules, the second sheet of material being fixed to a surface of the first sheet of material opposite the surface of the first sheet of material having the two stress relief anchor pads thereon; and

cutting the first and second sheets, through the via to separate the first and second sheets into separate integrated modules, each module having one of the two stress relief anchor pads and a portion of each of the plurality of vias in a periphery thereof.